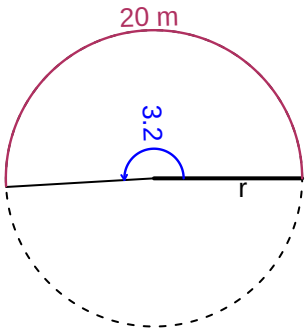
Name: Date:

Trig Final (Solution v44)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.2 radians. The arc length is 20 meters. How long is the radius in meters?

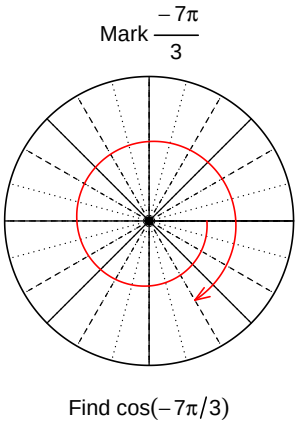


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

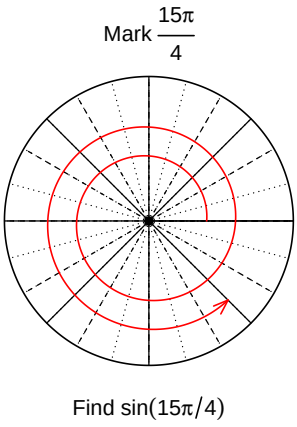
$r = 6.25$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-7\pi}{3}\right)$ and $\sin\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-7\pi/3)$



Find $\sin(15\pi/4)$

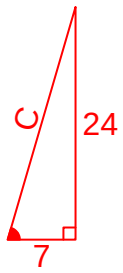
$\cos(-7\pi/3) = \frac{1}{2}$

$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{24}{7}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

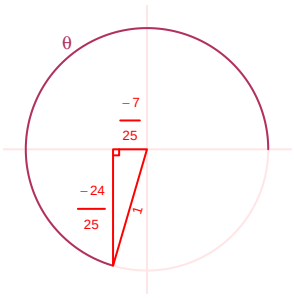
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-24}{25}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.73 meters, a midline at $y = 8.96$ meters, and a frequency of 5.02 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.73\sin(2\pi 5.02t) + 8.96$$

or

$$y = -2.73\sin(10.04\pi t) + 8.96$$

or

$$y = -2.73\sin(31.54t) + 8.96$$